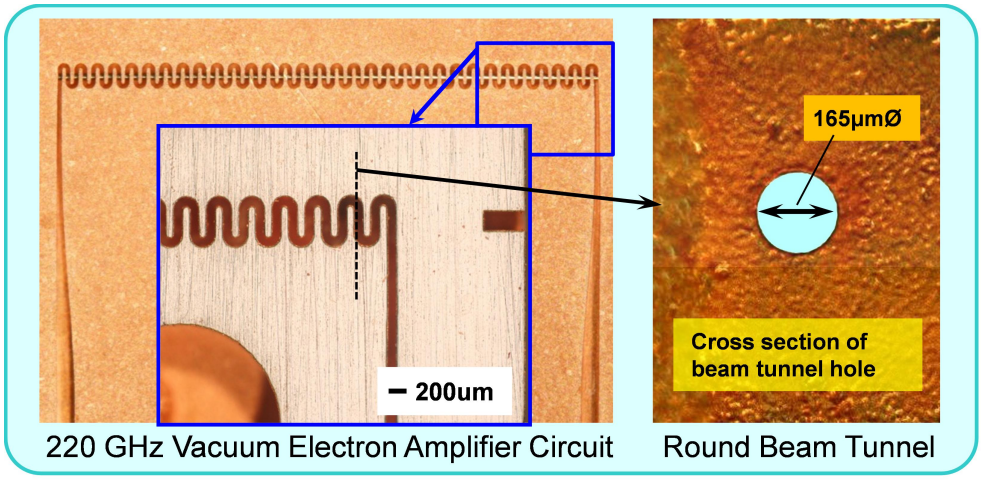
NAVAL RESEARCH LABORATORY

TECHNOLOGY LICENSING OPPORTUNITY

3D MICROFABRICATION OF BEAM TUNNELS FOR HIGH POWER VACUUM ELECTRONIC DEVICES



Advantages/Features

Overcomes fabrication process issues in the mmW and sub-mmW range with high yield

Enables fabrication of amplifier and oscillator circuits in a single step using a low-cost, UV flood source

Offers the capability for tunnel length-to-diameter aspect ratios of >500

Applications

High power mmW and sub-mmW vacuum electron sources for radar, imaging, communications, and biomedical applications

High power passive electromagnetic component such as filters, wave-guides, couplers

Microfluidic devices

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The Naval Research Laboratory (NRL) has developed a novel microfabrication process for creating highly precise, geometrically round tunnels in all-metal, photolithographically-formed structures for the purpose of transportingelectron beams through vacuum electro-magnetic slow-wave circuits in the millimeter wave (mmW) and sub-mmW frequency ranges (approx. 90 GHz to over 1 THz). This patent-pending technique uses polymer monofilaments embedded in the photoresist to hold the shape of a beam tunnel during the UV-LIGA photolithographic process. The resulting quasi-3D structures are easily electro-formed with low-loss, high thermal conductivity metals, such as copper, to create both precise electromagnetic circuits and electron beam tunnels in a single process step. This technique can similarly create multiple beam tunnels of arbitrary cross sectional shape, waveguides, passive electromagnetic structures (e.g. filters), or a wide range of microfluidic devices.

References

"Microfabrication of Fine Electron Beam Tunnels using UV-LIGA and Embedded Polymer Monofilaments for Vacuum Electron Devices," *Journal of Micromechanics and Microengineering*, 22 (2012): 015010.

"3D UV-LIGA Microfabricated Circuits for Wideband 50W G-band Serpentine Waveguide Amplifier," *36th Infared, Millimeter and Terahertz Waves (IRMMW-THz) Conference*, Houston, TX, Paper Tu4A.1, Oct. 2011.

Available for License: Patent Applications have been filed.